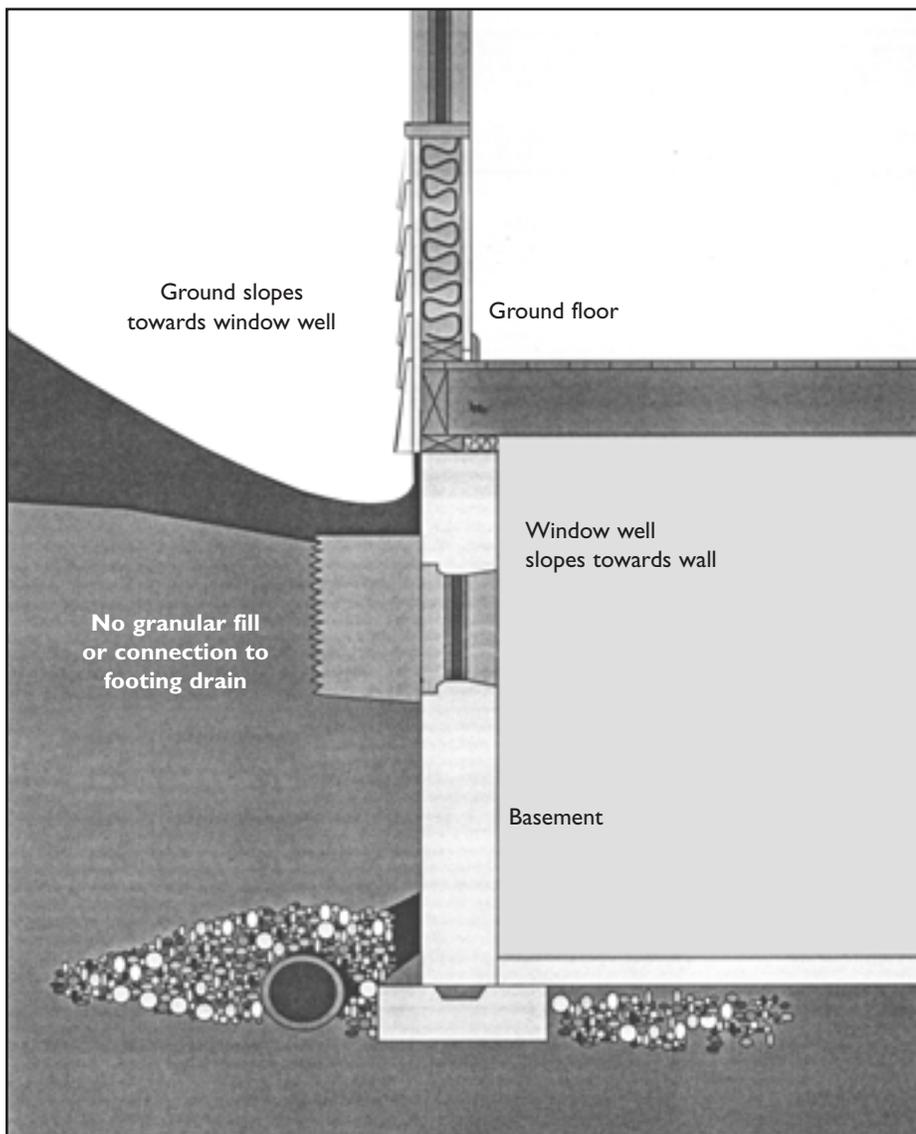


Before You Start Renovating Your Basement—Structural Issues and Soil Conditions



Renovating a full-height basement can add value and extra living space to your house. Even if you don't have a full basement or aren't planning any basement improvements, the foundation of the house is the most important consideration in any renovation. The foundation supports the structure above it and resists the pressure of the soil around it. Fixing any foundation problems before you renovate is essential to preserve the durability and structure of your home.

Figure 1 Common problems

COMMON SITUATIONS

The foundation for your house may be a full-height basement, a crawl space, a slab-on-grade foundation or even a combination of two or more types. Foundation materials include poured concrete, unit masonry, stone and preserved wood. Each type of foundation or material has its own associated problems.

The most common problems related to structure or soil conditions are:

- Cracks in slabs, walls or footings
- Crumbling mortar or concrete
- Unstable or weak soils
- Uneven settlement
- Warped or bowed foundation walls
- Adfreezing (frozen soil sticking to the foundation and lifting it) or frost heaving
- Low ceiling height
- Inadequate support of the main floor system
- Soil gas or radon infiltration
- Odours or generally poor indoor air quality (IAQ)
- High humidity
- Pest infestation

HEALTHY HOUSING™

Renovating is an ideal time to make your house healthier for you, the community and the environment. When doing your basement renovations, be sure to consider:

- **Occupant health**—mold cleanup, measures to prevent soil gas entry and spillage from combustion appliances, reducing exposure to contaminants from workshops or craft rooms, low emission materials, effective ventilation
- **Energy efficiency**—effective insulation and air barriers, energy efficient lighting
- **Resource efficiency**—energy efficient, reused or recycled components, durable materials that will last longer
- **Environmental responsibility**—efficient use of space and reusing or recycling construction waste
- **Affordability**—energy efficient appliances and fixtures to reduce operating costs, improved house durability to protect your investment

HOUSE AS A SYSTEM

A house is much more than just four walls and a roof—it's an interactive system made up of many components including the basic structure, heating, ventilation and air conditioning (HVAC) equipment, the external environment and the occupants. Each component influences the performance of the entire system. Renovation is an opportunity to improve the performance of your house.

Without a sound foundation, problems are inevitable. If problems with the foundation exist, they will often affect other parts of the building. Problems that you discover in the basement should be remedied before any other renovation work.

AVOID SURPRISES

Before you start any renovation, take some time to think about your foundation. Evaluate it carefully to make sure it's in good shape and can accommodate your renovation plans. Here are some of the likely situations that people encounter. However, it's always wise to consider hiring a qualified professional such as an engineer, architect or professional renovator to assess the structural issues.

ASK YOURSELF . . .

CONSIDER YOUR
OPTIONS . . .

. . . AND IF YOU DON'T

Cracks

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| <ul style="list-style-type: none"> ■ Are there any cracks in concrete walls or floors? If so: <ul style="list-style-type: none"> ■ How many are there? ■ Where are they located? ■ How wide are they? ■ Are they vertical or horizontal? ■ Have they remained the same for a long time or are they changing? | <ul style="list-style-type: none"> ■ Patch unchanging, small cracks from inside with cement-based material or use an injection-type repair material. ■ Fill unchanging large cracks from inside (and outside if possible) with "hygroscopic" concrete patch material that expands as it dries or use the polyurethane or epoxy injection system. ■ Consult a structural engineer or basement specialist concerning multiple, severe or expanding cracks. | <ul style="list-style-type: none"> ■ Minor cracks only require attention to prevent water or soil gas entry. ■ Major cracks can allow large quantities of water or soil gas to enter. ■ Severe or active cracks (particularly if they're horizontal) may be an indication of future problems or even present unsafe conditions that could lead to collapse. |
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Concrete deterioration

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| <ul style="list-style-type: none"> ■ Is there any porous, powdery or crumbling concrete or mortar? ■ Are there honeycombs (voids) in the concrete? ■ Is the surface layer of concrete breaking off (spalling)? | <ul style="list-style-type: none"> ■ Patch small areas of crumbled, honeycombed or broken concrete with a cement-based material. Consult a structural engineer for widespread problems. | <ul style="list-style-type: none"> ■ Small areas of crumbled, honeycombed or broken concrete will allow moisture and soil gas to enter. Deterioration may continue, affecting the structural strength of the foundation. ■ Large, damaged areas may be unsafe if they don't adequately support the existing house or proposed renovations. |
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ASK YOURSELF . . .

CONSIDER YOUR OPTIONS . . .

. . . AND IF YOU DON'T

Uneven settlement

- Does the foundation seem to be sinking or settling?
 - Do floor joists and beams seem to be uneven?
 - Was the foundation built on fill or disturbed soil?
 - Are the foundation walls warped or bowed inwards?
 - Do concrete floors appear to be lifted up?
- Determine the cause of the problem and make immediate repairs. If any of these situations are severe, get help from a professional.
 - Uneven settlement can cause concrete cracks or uneven floor joists and beams.
 - Footings on different soils can cause uneven loading. Pressure from the soil or from groundwater can warp or bow foundation walls inward, cause horizontal cracks and floors to rise.
- Uneven settlement may continue to disrupt the house structure. Bowed walls may collapse.

Adfreezing or frost heaving

- Is there cracking and heaving pressure in winter (often found at below-grade basement entries or house and garage connections)?
- Cracking or uplift may indicate adfreezing (frozen soil adhering to the foundation and lifting it) or frost heaving. Solve adfreezing by installing a drainage layer, polyethylene sheet or free-draining backfill around the foundation. Prevent frost heaving by installing better foundation drainage and insulating above footings. For serious problems, consult an expert.
- Adfreezing or frost heaving will continue to cause seasonal movement along with water and soil gas leaks. The resulting foundation instability can continue to damage the existing house and any proposed renovations.

ASK YOURSELF . . .

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. . . AND IF YOU DON'T

Structural changes

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| <ul style="list-style-type: none"> ■ Is there enough headroom below the floor framing and any ductwork to allow the basement to become useable living space? ■ Can the foundation adequately support the existing main floor system and any proposed renovations? | <ul style="list-style-type: none"> ■ For greater headroom, lower the floor and underpin the foundation or raise the house. ■ Seek professional advice to assess whether the foundation is adequate and to plan structural changes. ■ If converting attics to living space, or adding an extra storey, assume that the foundation will not support the added loads. Consult with a design professional to verify that the width of the existing footing meets current building codes. | <ul style="list-style-type: none"> ■ Lack of headroom will make it impossible to use the basement as living space. ■ Changing structural elements without sufficient planning can lead to unsafe conditions, including the sagging or collapse of main floors or foundation walls. ■ Adding extra loads may cause sinking, uneven settling and cracking. |
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Moisture and soil gases

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| <ul style="list-style-type: none"> ■ Are other houses in the area known to have high levels of radon or methane? ■ Is there a bad smell or high humidity in the basement? | <ul style="list-style-type: none"> ■ Measure average levels of radon concentration, if you are concerned. Test services are available in most major cities or through public health departments. ■ Air-seal the foundation completely. ■ Provide ventilation in the winter and dehumidify in the summer to lower humidity levels. | <ul style="list-style-type: none"> ■ Radon can accumulate in houses, causing unsafe exposure limits for occupants and a higher risk of lung cancer. ■ Moisture and other soil gases can contribute to humidity, odour and mold problems. |
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REWARDS

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| <ul style="list-style-type: none"> ■ Fixing foundation structural problems will help greatly to ensure the continued safety and durability of your home. | <ul style="list-style-type: none"> ■ Other planned renovations are much more likely to be successful when they are based on a sound foundation. |
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ASK YOURSELF . . .

CONSIDER YOUR OPTIONS . . .

. . . AND IF YOU DON'T

Pests

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| <ul style="list-style-type: none">■ Is there any evidence of termites or other insects?■ Are there rodents present or have they caused damage? | <ul style="list-style-type: none">■ Call an exterminator to get rid of termites.■ Eliminate hiding places, food and water sources. Set baits and traps. Destroy nests. Seal entry points. | <ul style="list-style-type: none">■ Termites, cockroaches, rodents and other pests are not only a nuisance and potential health hazard, but they can also cause serious damage to your home. |
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SKILLS TO DO THE JOB

A handy homeowner can patch small, unchanging cracks or other minor concrete problems, deploy a radon test kit or deal with minor pest problems. A skilled homeowner can attempt repairs to large, unchanging cracks or undertake a thorough air sealing project.

Professional help is essential for:

- Assessing and correcting changing cracks
- Lowering floors and underpinning or reinforcing foundations
- Adjusting structural elements
- Assessing loads and structural capacity
- Correcting adfreezing and frost heaving problems
- Correcting major pest infestations

Use the Basement Assessment Worksheet to help you assess problems and set priorities for your basement repairs.

Basement Assessment Worksheet				
Problem and location	Possible cause	Options	Help required	Estimated costs

COSTING YOUR PROJECT

Fixing foundation problems can be expensive. Use the above checklist to help you assess your options and costs. The cost of essential repairs will depend on varying conditions, such as:

- Existing foundation
- Access to problem areas
- Amount of work required outside, below-grade
- Extent of proposed renovations
- Professional help needed

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*Before You Start Renovating Your Basement
—Moisture Problems* Order No. 62250

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Sample Renovation Contract Order No. 62351

Assessing the Renovation Project Order No. 62246

Renovating Your Basement for Livability Order No. 64092

*Understanding and Dealing With Interactions Between Trees,
Sensitive Clay and Foundations* Order No. 62226

Get to Know Your Soil Order No. 63486

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Printed in Canada
Produced by CMHC 15-04-08
Revised 2001, 2002, 2003, 2005, 2008

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